

Preliminary Analysis of Hourly Traffic Data From the South Coast Air Basin

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Introduction

In support of our ongoing analysis of weekday-weekend differences in air pollution, we analyzed traffic data from the South Coast Air Basin during the summer of 1997. Because day-of-week differences in emissions may be dominated by differences in on-road vehicle activity, a full understanding of hourly traffic patterns may be crucial. Differences in these traffic patterns are central to more than one hypothesis concerning day-of-week differences in ozone concentrations. Although the traffic data are still incomplete and the methods are still being refined, we hope that the interim results shown here may assist in formulating further studies.

Data

Traffic managers in Los Angeles and Orange Counties use data from a CALTRANS network of sensors that gather traffic data continuously. The purpose of this network is to support a rapid response to accidents and other events that impede the smooth flow of traffic on the region's freeways. Data are collected in 30-second increments but the 30-second data are not archived routinely. By special arrangement, however, all of the 30-second data during the recent South Coast Ozone Study (SCOS97 - June 15 through October 10, 1997) were archived for further analysis. Some desirable data, such as vehicle type (car vs. 18-wheeler) and vehicle speed, are not included in the database. Also, the data are for freeways only and do not supply information on surface street traffic. Approximately one half of the total vehicle miles traveled (VMT) is on surface streets. Even so, the data are expected to help in comparisons of hourly traffic volumes by day-of-week throughout Los Angeles and Orange Counties.

The data we have analyzed so far represent a 40 square mile region, from North Long Beach in the South to Lynwood in the North. Freeway I-710 runs approximately down the north-south axis of this domain, which we refer to as the "Lynwood Domain". The Lynwood Domain includes approximately 75 sites that collect vehicle counts; at each site, separate 30-second counts are collected for each lane of the freeway. Two different multi-lane counters are needed to cover both sides of a freeway.

Methodology

For an overall perspective, freeway traffic counts in the entire Lynwood Domain were analyzed in aggregate. For this analysis, hourly averages by day-of-week were calculated

for each of the 75 sites (all lane counts at a site were merged). Hourly totals by day-of-week were then calculated by summing the average counts for each hour and day-of-week at all 75 sites. The hourly average counts for individual sites were based on as many as 16 summer days. In some instances, however, there were no days with valid counts or only a few days with valid counts on which to base an hourly average. Imbalance in the data and unequal numbers of “inbound” and “outbound” sites are issues to be addressed in a more refined analysis that is expected in the coming months. Despite the limitations of the current analysis, we do not expect the outcome of a more refined analysis to differ substantially.

We also analyzed data for six selected sites. Three freeways — I-710, I-405, and SR-91 — are each represented by a pair of sites; the sites in each pair are near one another with one site on each side of the freeway. For analyses of individual sites, hourly average counts by day-of-week were calculated using all available data. For graphs of single sites, only those hourly values based on at least 8 days of valid data were used.

Results

The overall, aggregate analysis is shown in Figure 1 (in the title, “Figure 3a” reflects the figure’s use in another document). This figure represents the sum of the counts at the 75 sites in the 40 square mile region for an average day. The implications of this analysis for tasks such as formulating hypothetical emissions scenarios, including emission inventories for modeling exercises, remain to be determined.

Figures 2 through 7 depict hourly average counts for individual sites within the Lynwood Domain. Similarities and differences in the hourly profiles at these six sites are interesting to note. For example, Figure 4 represents a site that has a pronounced outbound commute on weekday afternoons. Figure 6 is an example of a site with a strong inbound commute peak on weekday mornings. In all six cases, Sunday traffic is significantly less than weekday traffic. Although mid-day traffic on Saturday reaches weekday levels at all sites, during the early morning and mid-afternoon, Saturday traffic is typically less than the weekday levels.

If we treat each pair of sites as a “point source” of emissions, the sum of the counts for each pair is most meaningful. Figures 8, 9, and 10 show the total counts for each pair of sites. For these plots, hourly averages based on less than 8 hours of valid data were smoothed “by hand” if they were clearly outliers.

For convenient comparison, figures 11 and 12, based on Weigh-In-Motion (WIM) data at the North Long Beach station are included. The North Long Beach WIM station is in the southern part of the Lynwood Domain. [Additional graphs of WIM results at other stations are contained in a document found on the ARB Web site identified as *LDV & HDT Traffic Counts (revised 9/23/99)*.] These figures show 24-hour counts for vehicles by weight class (14 different classes identified); hourly counts are not yet available in the WIM data. Note that the decline of heavy-duty truck activity on weekends seems to be relatively greater than the decline of light-duty vehicle activity.

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Discussion

We present this information for the purpose of discussion, in the hope that it will suggest directions for continued research. A more comprehensive analysis of the available traffic data throughout Los Angeles and Orange counties is planned and currently underway.

Figure 1

Figure 3a. Analysis of Traffic Count Data
for the Lynwood Domain - by day of week

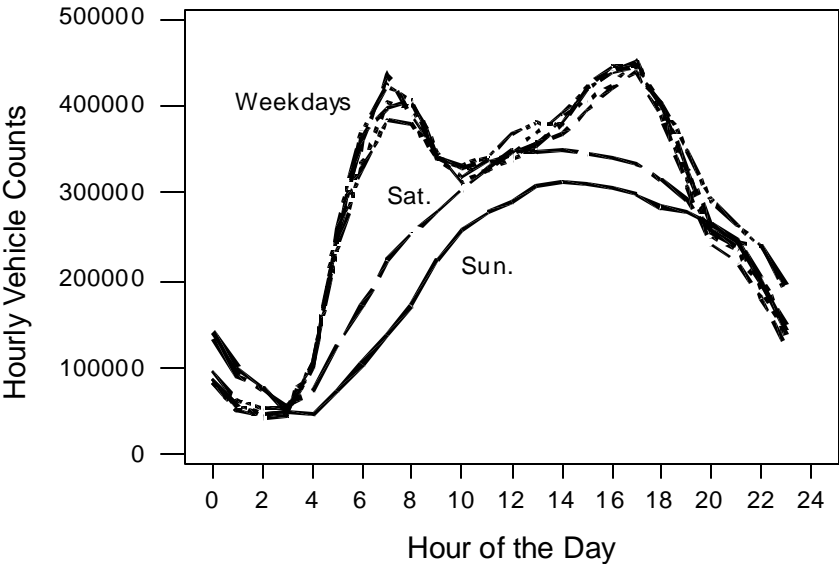


Figure 2

Preliminary Analysis of Freeway Traffic Data
(Lynwood Domain:I-710 Northbound - Site #20130)

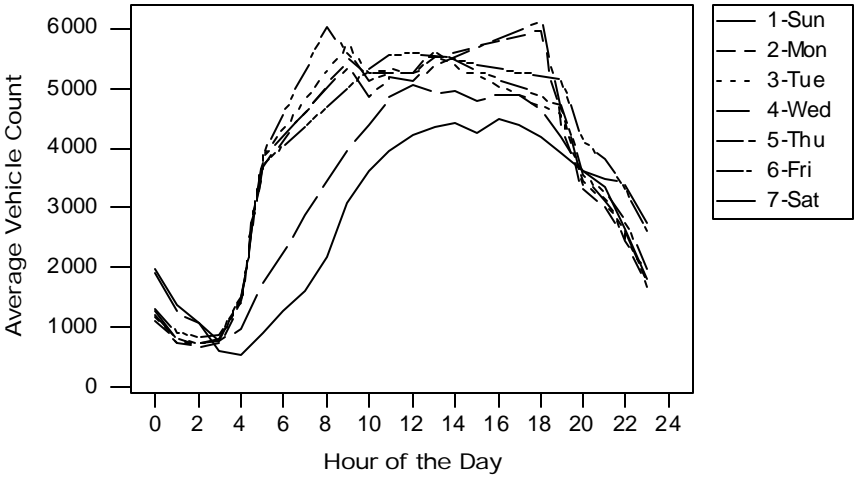
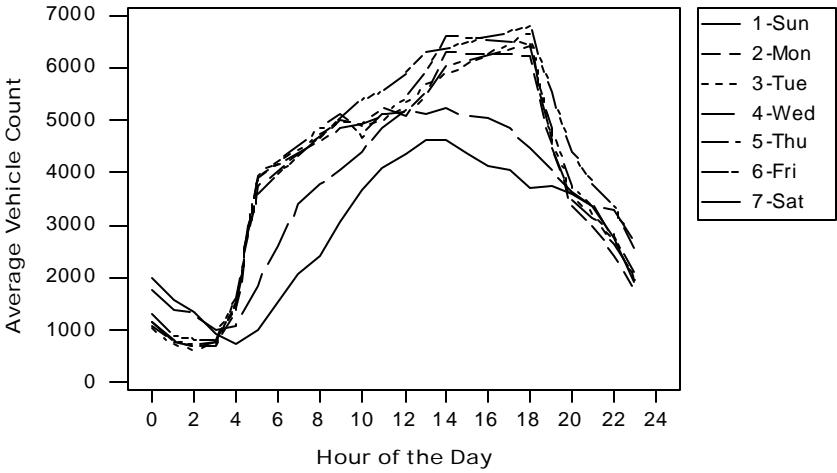


Figure 3

Preliminary Analysis of Freeway Traffic Data
(Lynwood Domain:I-710 Southbound - Site #20146)



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Figure 4

Preliminary Analysis of Freeway Traffic Data (Lynwood Domain:SR-91 Eastbound - Site #20383)

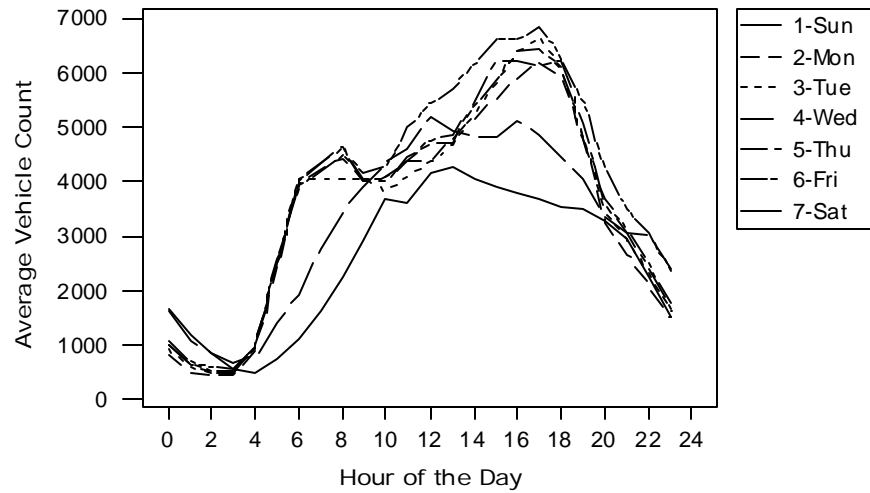


Figure 5

Preliminary Analysis of Freeway Traffic Data (Lynwood Domain:SR-91 Westbound - Site #20394)

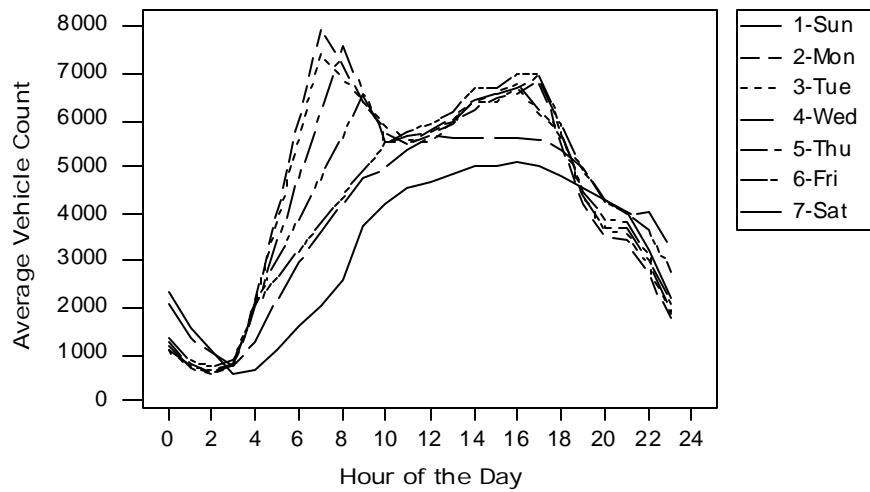


Figure 6

Preliminary Analysis of Freeway Traffic Data
(Lynwood Domain:I-405 Northbound - Site #20521)

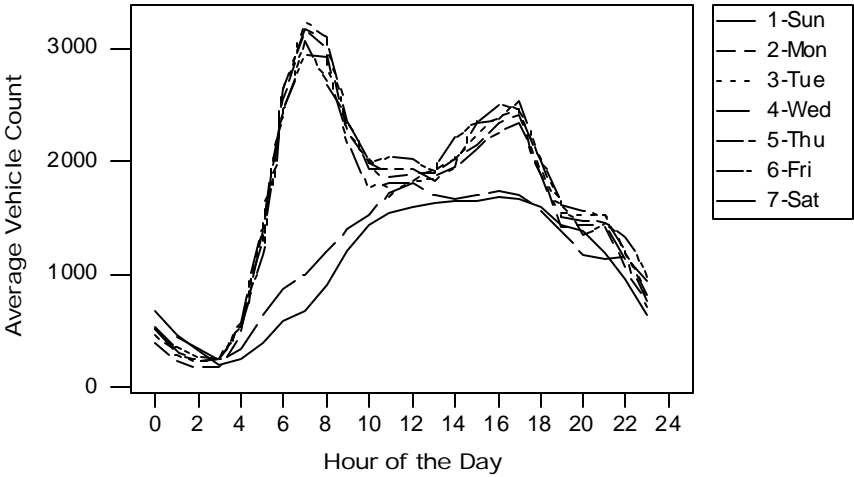


Figure 7

Preliminary Analysis of Freeway Traffic Data
(Lynwood Domain:I-405 Southbound - Site #20522)

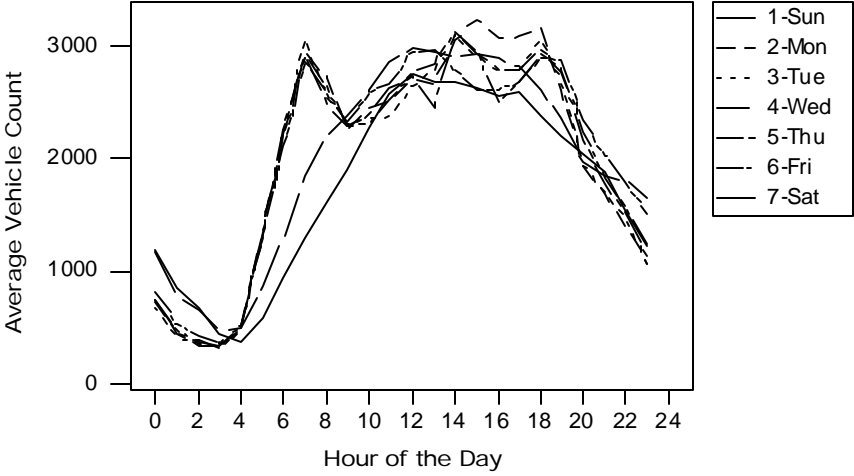


Figure 8

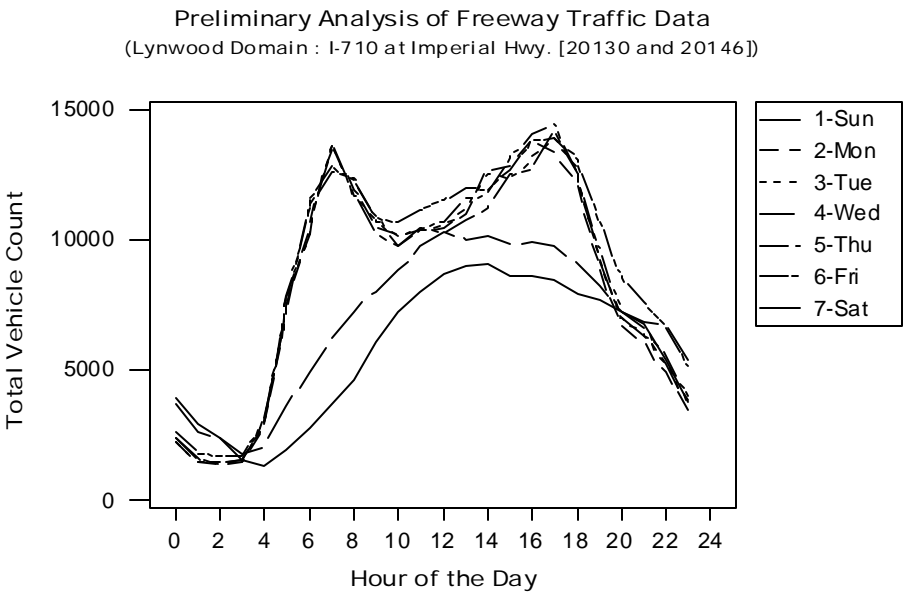


Figure 9

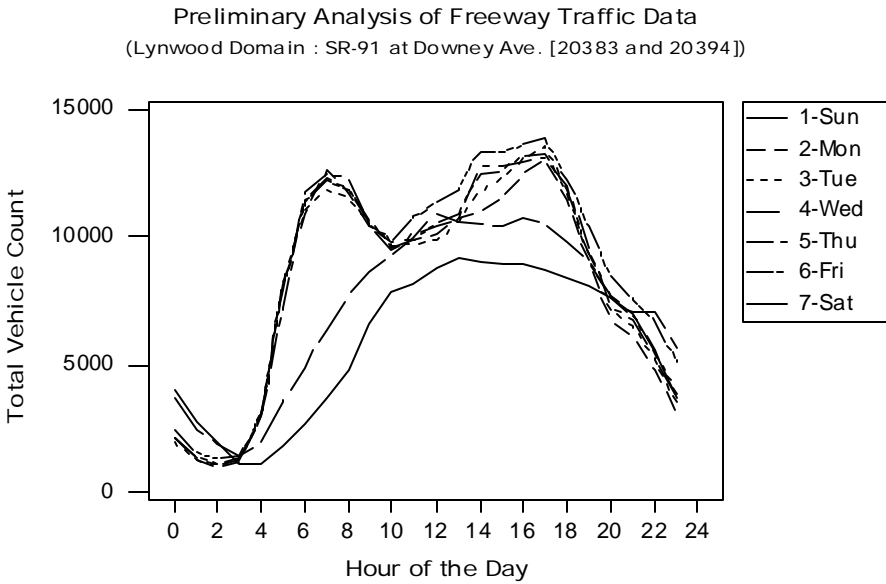
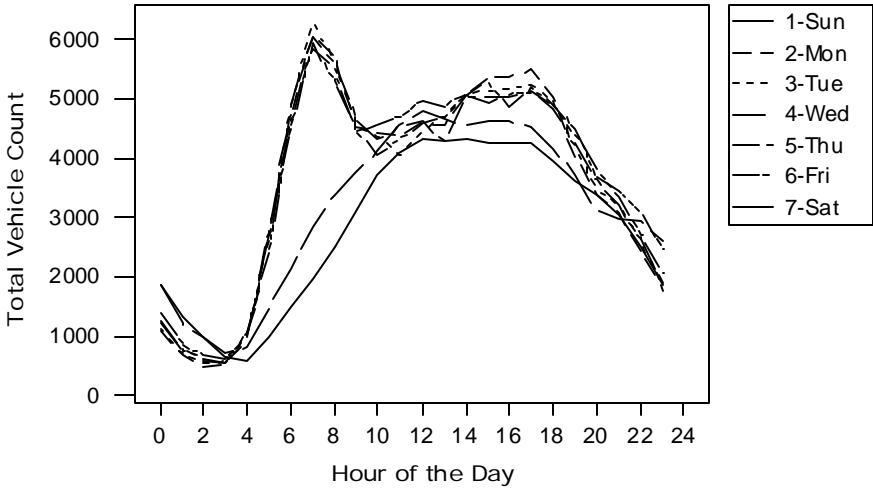


Figure 10

Preliminary Analysis of Freeway Traffic Data
(Lynwood Domain : I-405 at Cherry Ave. [20521 and 20522])



The following two graphs are reprinted from the document listed as *LDV & HDT Traffic Counts* on the Weekend Effects Research web site.

Figure 11

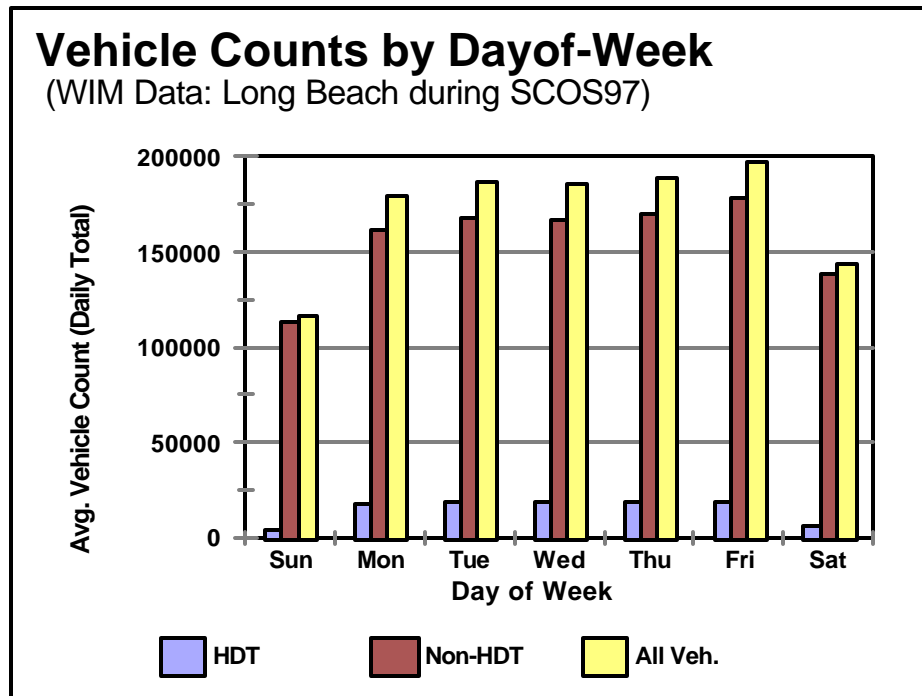


Figure 12

